

REMARKS/ARGUMENTS

Claims 9, 10, 12-14 and 16 were rejected under 35 U.S.C. §103 as unpatentable over Uehara et al. '840 in view of Ueno et al. '905 and Padhi et al. '523. Claims 11 and 15 were rejected over the foregoing references, and further in view of Chau et al.

Response to Rejection

Claim 9 is being amended. Claims 10-12 remain dependent from claim 9 as amended, and no amendment is being made to these dependent claims.

Claim 9 is being amended to state that the controller “stores the heated treating solution in said treating tank...” This feature is supported in the published specification at paragraph [0031] stating, “...and numeral 22 denotes a treating tank storing the heated phosphoric acid solution...”; and at paragraph [0046] stating, “The treating station 6... having a treating tank 22 for storing a heated phosphoric acid solution, ...”

Claim 9 is further being amended to state that the controller “keeps said substrate holding device, without the substrates, on standby in the same heated treating solution stored in said treating tank,” as supported in paragraph [0031] stating, “...The lifter 20 corresponds to the substrate holding device in this invention.”; paragraph [0032] stating, “The substrate treating method in this embodiment is characterized in that the lifter 20 is preheated by being immersed in the heated phosphoric acid solution stored in the treating tank 22 before immersing the lifter 20 holding a plurality of wafers W in the heated phosphoric acid solution (see the left end portion of Fig. 2).”; and Fig. 2 showing that the substrate holding device not holding the substrates is kept on standby in the same heated treating solution stored in the treating tank.

Claim 9 and its dependent claims are patentably distinguishable from U.S. Patent No. 6,767,840 (Uehara et al.), U.S. Patent No. 5,421,905 (Ueno et al.), U.S. Patent Publication No. 2003/0209523 (Padhi et al.) and U.S. Patent Publication No. 2003/0132480 (Chau et al.).

The references neither disclose nor suggest “a controller which stores the heated treating solution in said treating tank, and keeps said substrate holding device, without the substrates, on standby in the same heated treating solution stored in said treating tank to preheat said substrate holding device, and when the plurality of substrates are transported by said substrate transport

mechanism to said treating tank, raises said substrate holding device from said treating tank to receive the plurality of substrates from said substrate transport mechanism, and lowers said substrate holding device having received the plurality of substrates to immerse the substrates in the heated treating solution in the treating tank, thereby to treat the substrates” as recited in claim 9 of the present application.

U.S. Patent No. 6,767,840 (Uehara et al.) states, “Silicon wafers were set in the wafer processing bath filled with a solution mixture of ammonia, hydrogen peroxide, and ultrapure water at about 80°C” (Column 10, lines 65-67). This suggests treating with a heated treating solution in the treating tank.

Uehara et al. further states, “In this example, a heat treatment was further performed in a hydrogen atmosphere at 1,100°C for about 1 h” (Column 14, lines 41-42). This suggests a heat treatment in an atmosphere.

U.S. Patent No. 5,421,905 (Ueno et al.) describes that an IR heater 52 is used to clean and dry the back plate of wafer fork 41 (which the Examiner has likened to the substrate holding device of the present claims).

However, these references do not have at least the following technical concept of claim 9, i.e., “keep[ing] said substrate holding device, without the substrates, on standby in the same heated treating solution stored in said treating tank to preheat said substrate holding device, and when the plurality of substrates are transported by said substrate transport mechanism to said treating tank, rais[ing] said substrate holding device from said treating tank to receive the plurality of substrates from said substrate transport mechanism, and lower[ing] said substrate holding device having received the plurality of substrates to immerse the substrates in the heated treating solution in the treating tank, thereby to treat the substrates”.

As noted above, Uehara et al. treats with either the heated treating solution in the treating tank or with a heated atmosphere, rather than with a substrate holding device as in claim 9. As noted above, Uehara et al. performs a heating operation during treatment, rather than before the immersion as in the present invention.

As further noted above, although Ueno et al. heats the substrate holding device as recited, the timing of heating is during cleaning and drying treatment, and not before the immersion

treatment as in the present claims.

The foregoing references are not supplemented by either US 2003/0209523 (Padhi et al.) or US 2003/0132480 (Chau et al.), or both combined. The references, separately or in combination, neither disclose nor suggest the technical concept of claim 9. Therefore, claims 9-12 are requested to be allowed.

Claim 13 is also allowable over the art. (Formal, non-limiting amendments are being made.) Claims 14-16 remain dependent from claim 13 as amended. As amended, claims 13 recites in part:

a controller that controls the treatment of the substrates by immersing said substrate holding device holding the substrates in the heated treating solution stored in said treating tank;

wherein said substrate holding device includes a plurality of holding rods for holding the plurality of substrates in vertical posture, and a back plate supporting said holding rods in cantilever fashion, said back plate having a heating device; and

said controller further preheats said back plate by means of said heating device before the treatment of the substrates.

See, for example, paragraph [0057] which states: “(1) ...The lifter 20 may be preheated before treating a group of wafers W, ...Alternatively, the lifter 20 may be preheated by a heating device such as a heater provided therefor.” Further, paragraph [0058] states: “(2) Fig. 7 shows a modification in which a heating device such as a heater [is] provided for the lifter 20 in the apparatus shown in Figs. 5 and 6. The holding rods 20a of the lifter 20 have a relatively small heat capacity, and therefore have a relatively little thermal influence on the heated phosphoric acid solution. On the other hand, the back plate 20b has a large heat capacity, and has a strong thermal influence on the phosphoric acid solution. Thus, a heater 20c is mounted in or on the back plate 20b of the lifter 20 to preheat the back plate 20b, thereby to suppress the thermal influence on the heated phosphoric acid solution. This measure also is effective to suppress variations in treatment occurring among substrates treated collectively.” Moreover, Fig. 7 shows the substrate holding device having a heating device provided for the back plate.

The references neither disclose nor disclose nor suggest “a controller which controls the treatment of the substrates by immersing said substrate holding device holding the substrates in the heated treating solution stored in said treating tank; ...said controller further preheats said back plate

by means of said heating device before the treatment of the substrates” as recited in claim 13 of the subject application.

As noted in relation to claim 9 above, the references cited do not recognize the related subject matter of claim 13, an answer to the problem that the substrates treated as a batch are subject to an inconvenience of an etching amount varying from substrate to substrate. The references neither disclose nor suggest the technical concept of claim 13 that the substrate holding device is preheated before the immersion treatment.

Thus, the references neither disclose nor suggest in any way a technical concept similar to that of claim 13. Therefore, claim 13 in this application is not obvious from the references cited. Claims 14-16 in this application depend from claim 13, and also are not obvious from the references.

In view of the foregoing amendments and remarks, allowance of claims 9-16 is requested.

New References

The latest Office Action has newly cited U.S. Patent No. 6,761,178 (Kuroda et al.) and U.S. Patent No. 6,251,232 (Aruga et al.).

In Kuroda et al., as shown in Figs. 7-11, it is suggested that wafer chucks pass wafers to a wafer guide, and the wafer guide immerses the wafers in a cleaning bath for cleaning treatment. Particularly, in col. 12, lines 53-57, Kuroda et al. states, “As a result of lowering the wafer guide 31 to the cleaning position A, the wafers W are accommodated in the cleaning bath 30, so that the wafers W are dipped into the cleaning liquid filled in the cleaning bath 30, accomplishing the cleaning operation against the wafers W.” Before the wafer guide immerses the wafers in the cleaning bath for cleaning treatment, the wafer guide is once kept on standby as shown in Fig. 6.

That is, Kuroda et al. states, “the wafer chucks 20a, 20b of the transferring apparatus 15 slide to the cleaning apparatus 11, as shown in Fig. 6. In this way, the wafers W held by the wafer chucks 20a, 20b are loaded into the cleaning apparatus 11. Besides, before loading the wafers W into the cleaning apparatus 11 in the above way, the wafer guide 31 is lowered in advance thereby to occupy the cleaning position A on the bottom in the cleaning bath 30,” see column 10, lines 48-55, and Fig. 6, and “the slide movement of the wafer chucks 20a, 20b is suspended thereby to prevent an occurrence of collision between the wafer guide 31 and the wafer chucks 20a, 20b in loading the

wafer guide 31 and the wafer chucks 20a, 20b in loading the wafers W into the cleaning apparatus 11.” (See column 10, line 64 to column 11, line 3.) Thus, it is suggested that the wafer guide is once kept on standby in the cleaning bath to avoid collision between the wafer guide and the wafer chucks before treating the wafers.

It will be understood from the above that Kuroda et al. sets the wafer guide (corresponding to the substrate holding device of the present invention) in the cleaning bath (corresponding to the treating tank of the present invention) before the treatment, solely for the purpose of a standby step. It is not for the purpose of preheating the substrate holding device before treatment as in the present claims.

Kuroda et al. neither discloses nor suggests in any way “stores the heated treating solution” as claimed. Kuroda et al. neither discloses nor suggests in any way “keeps said substrate holding device, without the substrates, on standby in the same heated treating solution stored in said treating tank” as claimed.

Kuroda et al. does not suggest that a treating solution like a cleaning solution is stored in the cleaning bath. Even if such a treating solution is stored, it will not be a heated treating solution as herein, but will be the cleaning liquid in Kuroda et al.

It would not be obvious to replace the cleaning liquid in Kuroda et al. with the heated treating solution. This is because, as noted above, Kuroda et al. sets the wafer guide in the cleaning bath before the treatment simply for the purpose of a standby step, and not for the purpose of heating the substrate holding device before treatment.

It will be understood from the above that the references cited in the latest Office Action (Kuroda et al. and Aruga et al.), as well as those cited previously, do not have at least a technical concept now claimed, i.e., “stores the heated treating solution in said treating tank, and keeps said substrate holding device on standby in the same heated treating solution stored in said treating tank to preheat said substrate holding device, and when the plurality of substrates are transported by said substrate transport mechanism to said treating tank, raising said substrate holding device from said treating tank to receive the plurality of substrates from said substrate transport mechanism, and lowering said substrate holding device having received the plurality of substrates to immerse the substrates in the heated treating solution in the treating tank, thereby to treat the substrates”.

Thus, the Kuroda and Aruga references neither disclose nor suggest in any way the technical concepts of the present claims.

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